The Differences Upper Incisor and Upper Molar Alveolar Bone Loss between Smoker and Non-Smoker Patient with Chronic Periodontitis

Perbedaan Kehilangan Tulang Alveolar Gigi Insisivus dan Molar Rahang Atas Antara Pasien Perokok dan Bukan Perokok dengan Periodonitis Kronis

Aini Hariyani Nasution*, Martina Amalia, Cornelia Christy Tarigan
Depatemen Periodonsia
Faculty of Dentistry, Universitas Sumatera Utara
Jl. Alumni No.2 Kampus USU Medan 20155
*Corresponding Author: ainina.dentist@gmail.com

Abstract

Chronic periodontitis is identified by gingival inflammation, periodontal pocket, loss of attachment, and alveolar bone loss. Smoking is a risk factor of periodontal disease that has a direct effect on periodontal tissue. Smoking prevalence in Indonesia during 2013 was about 56,7% among men and about 1,9% among women. Smoking modifies the periodontal microbial challenge and host's cytokine levels. Some studies showed that smoker has greater alveolar bone loss than a non-smoker, and teeth that have the greatest alveolar bone loss are incisor and followed by molar. The aim of this study is to know the upper incisor and upper molar alveolar bone loss differences between smoker and non-smoker patient with chronic periodontitis. The study's samples are 92 chronic periodontitis statuses and 200 periapical radiographs that selected by purposive sampling technique from periodontia installation of RSGM USU. This study will measure the distance between cemento enamel junction to alveolar bone crest, cemento enamel junction to tooth apex, and alveolar bone loss percentage at upper incisor and upper molar. To compare the differences upper incisor and upper molar alveolar bone loss between smoker and non-smoker patient with chronic periodontitis will be analyzed by independent t-test and Mann-Whitney U test. The result showed that smoker has greater alveolar bone loss than a non-smoker. There are no significant differences at upper incisor alveolar bone loss and there are significant differences at an upper molar alveolar bone loss between smoker and non-smoker patient with chronic periodontitis.

Key words: chronic periodontitis, smoker, alveolar bone loss, upper incisor, upper molar

Abstrak

Periodontitis kronis ditandai dengan inflamasi, terbentuknya poket peridontal, kehilangan perlekatan, dan kehilangan tulang. Merokok merupakan salah satu faktor risiko yang berhubungan langsung dengan penyakit periodontal. Prevalensi perokok pada tahun 2013 di Indonesia terdiri dari 56,7% laki-laki dan 1,9% perempuan. Rokok dapat memodifikasi respon jaringan periodontal terhadap pertahanan mikroba dan level sitokin pada host. Penelitian sebelumnya menyatakan perokok memiliki kehilangan tulang lebih besar dibandingkan dengan bukan perokok, dimana gigi yang mengalami kehilangan tulang paling besar adalah gigi insisivus dan diikuti oleh molar. Tujuan penelitian ini adalah untuk mengetahui ada atau tidak perbedaan tinggi tulang alveolar gigi insisivus dan molar rahang atas pada pasien periodontitis kronis perokok dan bukan perokok. Sampel penelitian dipilih dengan menggunakan teknik *purposive sampling*, 92 eksemplar status pasien periodontitis kronis di Instalasi Periodonsia RSGM FKG USU dengan 200 foto periapikal dilakukan pengukuran jarak *cemento enamel junction* ke puncak tulang alveolar, jarak puncak tulang alveolar ke apeks akar, dan persentase kehilangan tulang alveolar pada gigi insisivus dan molar rahang atas. Untuk membandingkan perbedaan kehilangan tulang alveolar gigi insisivus dan molar rahang atas pasien periodontitis kronis perokok dan bukan perokok dilakukan uji t tidak berpasangan dan uji *Mann-Whitney U*. Hasil penelitian menunjukkan terdapat perbedaan kehilangan tulang alveolar namun tidak signifikan pada gigi insisivus rahang atas ($p>0,05$) dan terdapat perbedaan signifikan kehilangan tulang alveolar pada gigi molar rahang atas pada pasien periodontitis kronis perokok dan bukan perokok ($p<0,05$).

Kata kunci: periodontitis kronis, perokok, kehilangan tulang alveolar, insisivus rahang atas, molar rahang atas.

INTRODUCTION

Periodontitis is one of the most common oral diseases. Periodontitis is identified by gingival inflammation, periodontal pocket, loss of attachment, and alveolar bone loss. Periodontitis is an irreversible multifactorial disease that caused by dental plaque and host response.[1] Centers for Disease Control, American Academy of Periodontology, estimates that 47,2% or 64,7 million American adult in the United States 2009 and 2010 have mild, moderate, and severe periodontitis. In adults 65 and older, prevalence rates increase to 70,1%.[2] Periodontitis as one of periodontal disease have high prevalence and high impact on social life and life's quality.[3] Periodontitis risk factors are diabetes mellitus, psychology factor, microorganism, and smoking.[4]

Smoking has a significant relationship with periodontal disease. Some studies state that that in India, 32,7% smoker are men, and in the United States 25% adults are a smoker. Smoking modifies the periodontal microbial challenge and host cytokine levels. There is an imbalance between those factors and make the periodontal tissue become worse.[1]

Studies said smoker has the greater alveolar bone loss, loss of attachment, and periodontal pocket compared to a non-smoker. Fernando Reno, *et al.* in 2007, analyzed about alveolar bone loss in anterior teeth between smoker and non-smoker patient with chronic periodontitis in Brazilian said that alveolar bone loss in a smoker is greater than non-smoker and incisor has greater alveolar bone loss followed by molar.[5] So did Montaser, *et al.* in 2011 said that there are significant differences in alveolar bone loss between smoker and non-smoker, and maxilla has the greater alveolar bone loss compare to mandibula, but the differences aren't significant.[6]

Based on the dangers of smoking to health, especially periodontal tissue which is alveolar bone, the authors found it necessary to make a research about the differences upper incisor and upper molar alveolar bone loss in smoker and non-smoker patients with chronic periodontitis in Periodontia Installation RSGM FKG USU.

MATERIALS AND METHODS

This study is analytic descriptive with cross-sectional research design. This study uses RSGM secondary data from installation periodontia that is in the form 92 chronic periodontitis statuses and 200 periapical radiographic that selected by *purposive sampling* technique in Periodonsia Installation RSGM FKG USU 2016-2017. The inclusion criteria are the periapical radiographs of a patient with chronic periodontitis are apparent. The exclusion criteria are periapical radiographs patients with chronic periodontitis which are with traumatic occlusion, food impacttion, osteoporosis, diabetes mellitus, and periapical radiographs that disturbed by restoration, prothesis, and overlapping radiographic. This study was approved by ethical commitee from the Faculty of Medicine USU (No. 391/TGL/KEPK FK USU-RSUP HAM/2017).

This study will measure the distance between cemento enamel junction (CEJ) to an alveolar bone crest (ABC), and CEJ to tooth apex (AP) and alveolar bone loss percentage at upper incisor and upper molar. Bone loss percentage formula:[3]

$$\frac{(\text{CEJ} - \text{ABC}) - 2\ \text{mm}}{(\text{CEJ} - \text{AP}) - 2\ \text{mm}} \times 100$$

We measure the distance cementoenamel junction by using caliper and lightbox. To compare the differrences upper incisor and upper molar alveolar bone loss at a patient with chronic periodontitis between smoker and non-smoker will be analyzed with independent t-test and Mann-Whitney U test.

RESULTS

Table 1 shows the demographic data and dental history. It shows that based on sex, most smokers were male (67.39%) and the most non-smokers group were female (76.09%). By age, both smokers and non-smokers group were the most aged 41-60, there are thirty-two (69.57%) smokers and twenty-eight (60.87%). Based on the frequency of toothbrushing, both in the group of smokers and non-smokers were the most brushing tooth twice a day. Groups of smokers were fifteen (32.61%) and non-smokers were eighteen (39. 13%). Twenty-six (56.52in the form of%) of patients with chronic periodontitis smokers and twenty-four (52.17%) non-smokers have never done dental treatment to the dentist.

Table 1. Distribution of demographic data and dental history of patients with chronic periodontitis at the installation of Periodontia RSGM FKG USU.

Variable	Chronic Periodontitis			
	Smoker		Non-smoker	
	n	%	n	%

Sex				
Male	31	67.39	11	23.91
Female	15	32.61	35	76,09
Age				
20-40	5	10.87	10	21.74
41-60	32	69.57	28	60.87
61-80	9	19.56	8	17.39
Tooth-brushing frequency in a day				
Once	13	28.26	10	21.74
Twice	15	32.61	18	39.13
Three times	10	21.74	10	21.74
Uncertain	8	17.39	8	17.39
Dental treatment				
Never	26	56.52	24	52.17
Been treated	20	43.48	22	47.83
Total	46	100	46	100

Table 2 shows that both the chronic periodontitis of smokers and non-smokers at most were severe. 74 teeth (74.75%) in smokers and 75 teeth (74.26%) in non-smokers.

Table 2. Data types of chronic periodontitis based on loss level of attachment to smokers and non-smokers

Periodontitis Type	Smoker		Non-smoker	
	n	%	n	%
Mild		9.09		
Moderate	9	16.1	8	7.92
Severe	16	6	18	17.82
	74	74.7 5	75	74.26
Total	99	100	101	100

The CEJ-ABC distance between smoker and non-smoker was analyzed using Mann-Whitney U. Table 3 shows there was a significant difference between smokers and non-smoker.

The CEJ-ABC distance in the maxillary incisor of smokers was greater than non-smokers with p = 0.049. The CEJ-ABC distance in maxillary upper molars is higher than non-smokers with p = 0,000.

Table 3. CEJ-ABC Distance Differences

Variable	Incisor	Molar
	Mean ± SD	Mean ± SD
Smoker	5.76 ± 1.91	5.03 ±1.01
Non-smoker	5.16 ± 2.13	3.59 ± 0.65
P	0.049*	0.000*

*Significant (*p<0.05*)

Table 4 shows there is a difference in percentage of incisor maxillary alveolar bone loss between smokers and nonsmokers, but the difference is not significant. The percentage of alveolar bone loss in the maxillary incisors of smokers was greater than non-smokers with p = 0.064 and there is a significant difference in the percentage of molar maxillary alveolar bone loss between smokers and nonsmokers. The percentage of alveolar bone loss in maxillary upper molars was higher than nonsmokers with p = 0.000.

Table 4.Bone Loss Percentage Differences

Variable	Incisor	Molar
	Mean ± SD	Mean ± SD
Smoker	31.91 ± 14.71	35.21 ±12.09
Non-smoker	27.09 ± 17.50	20.14 ± 9.38
P	0,064	0,000*

*Significant (*p<0,05)*

Table 5 shows the percentage of alveolar bone loss by type of periodontitis between smokers and non-smokers and there is a greater alveolar bone loss in smokers than non-smokers in mild, moderate, and severe periodontitis. In mild and moderate periodontitis the data were tested with independent t-test and Mann-Whitney U for severe periodontitis. There is a signi-ficant difference in the percentage of alveolar bone loss between smokers and non-smokers in all type of periodontitis.

Table 5. Differences percentage of alveolar bone loss by type of periodontitis

Periodontitis type	Alveolar Bone Loss		*p*
	Smoker	Non-smoker	
Mild	32.48 ± 10.70	19.05 ± 8.29	0.012 *
Moderate	27.89 ± 9.99	19.43 ± 8.28	0.011 *
Severe	34.71 ± 14.40	25.06 ± 15.75	0.000 *

*Significant (*p<0,05)*

DISCUSSION

Demographic data (Table 1) showed that in patients with chronic periodontitis, most smokers were male and non-smokers at most were women. The results of this study are by data from the World Health Organization (WHO) which shows that the prevalence of smokers in 2012 in the world consists of 36.1% male and 6.8% female, in Southeast Asia consists of 32.1% male and 2.6% female. Riset Kesehatan Dasar (RIS KESDAS) shows the prevalence of smokers by 2013 in Indonesia consists of 56.7% of men and 1.9% of women.[7]

By age group, both smokers and non-smokers were 41-60. The results of this study were similar with data from the Centers for Disease Control and Prevention (CDC) which showed that by age, smokers were at most 18-64 years old compared with age over 65 years and over, most were at the age of 25-64 year. Eighteen people in every age 25-44 years are smokers (17.7%) and 17 out of 100 people at every age 45-64 years are smokers (17.0%).[8]

Based on dental history data the most smokers and non-smoker group brushed their teeth twice a day. The data is similar to data from The Health and Social Care Information Center in 2011 which says 75% of adults brush twice a day, 23% brush once a day and 2% less than once or never brush their teeth.[9] Based on dental care history data, most smokers and non-smokers had never done dental treatment to the dentist. This is in contrast to data from Eurobarometer stating that people in Europe as much as 42% visit dentists at least once a year.[10] This data difference may be due to differences in research populations that include socio-economic and population awareness levels about oral health.

Table 2 shows that in both chronic periodontitis patients smokers and non-smokers at most were severe periodontitis, This is different from the research of P. I. Eke, *et al.* mentioned in 2009 and 2010, based on data from the National Health and Nutrition Examination Survey (NHANES) 47% or 64.7 million adults experienced periodontitis ie, 8.7% mild periodontitis, 30% moderate periodontitis, and 8.5% periodontitis weight.[11] The results of these different studies may be due to different research populations and when associated with dental care history, this study sample showed more who never took tooth care to dentists than had ever treated teeth. This will certainly affect the severity of chronic periodontitis held by the patient.

The mean values of CEJ-ABC distance in the maxillary and maxillary tooth showed higher results in the smoker group compared with the non-smokers group (Table 3) and the incisors showed the greatest alveolar bone loss.

The results of this study are similar to Fernando Reno, *et al.* and Montaser *et al.* that is, there is a difference in alveolar bone loss between smokers and non-smokers, whereas greater alveolar bone loss occurs in smokers than nonsmokers and incisors have greater alveolar bone loss than molar teeth. Research Fernando Reno, *et al.* in 2007 of alveolar bone loss in smokers and nonsmokers by measuring the distance CEJ-ABC using digital calipers in the Brazilian population with chronic periodontitis found out that the mean distance of CEJ-ABC smokers in incisors was 3.74 ± 0.27 and molar teeth 3.36 ± 0.04. In non-smokers, the CEJ-ABC distance of the incisors was 2.34 ± 0.26 and in the 2.62 ± 0.49 molar teeth. Bone loss in smokers is greater than non-smokers, where the teeth that have the greatest bone loss are the incisors and are followed by the molar. There is a significant difference in alveolar bone loss between smokers and nonsmokers in both teeth.[5] Montaser *et al.* in 2011 conducted research on alveolar bone loss in periodontitis patients also by measuring the distance of CEJ-ABC using Scion Image Analysis Software got result that the average distance of CEJ-ABC on incisor teeth 4.65 ± 0.35 smokers and smoker molar 4.22 ± 0 , 54. In non-smokers the mean value of CEJ-ABC distance in incisors 3,34 ± 0,16 and molar 3,21 ± 0,43. Bone loss of the maxilla is larger but insignificant than the maxilla.[6]

In this study, the alveolar bone loss in both smo-kers and nonsmokers was greater than in previous studies. This may be due to a demographic and socioeconomic difference that can affect the alveolar bone loss due to the different habits and awareness of oral hygiene. Geographical differences that make demographic, environmental, genetic, and ethnic differences can influence periodontal circumstances. The difference in alveolar bone loss, in which greater CEJ-ABC distance occurs in the maxillary incisors compared with molar teeth is caused by the direct effect of smoking on maxillary incisors.[9] This may also be due to the research of Fernando Reno, *et al.* and Montaser *et al.* the measured tooth is not limited to the maxillary incisors alone, but the maxillary and mandibular incisors. Periapical radiographic photographs in this study were obtained from the examination sheet of chronic periodontitis patients (secondary data) from 2016-2017, while previous studies are from primary data. Photo quality will certainly affect the measurement results.

Besides, in the Montaser *et al.* the tool used to measure alveolar bone loss is to use Scion Image Analysis Software so that errors in measurement are smaller than manual measurements using digital calipers.5,6 In this study the history of duration of periodontitis is one of the uncontrollable variables, thus affecting the alveolar bone loss. The severity of periodontal disease and the loss of alveolar bone is affected by time, in which periods of periodontal tissue exposed to plaque affect the periodontal tissue.[12]

The percentage of alveolar bone loss of the maxillary and mandibular teeth showed a greater loss in the smokers' group than nonsmokers. In table 4 it can be seen that a greater percentage of alveolar bone loss occurs in the maxillary molars than the maxillary incisors. This is because the root length (the distance of CEJ-AP) of the maxillary molar is less than the maxillary incisors. The percentage of alveolar bone loss can be measured by comparing the CEJ-ABC distance with the CEJ-AP, each spacing is subtracted by two and multiplied by 100%. The comparison will be affected by the overall length of the root (CEJ-AP). Therefore, the greater the CEJ-AP distance the percentage of alveolar bone loss will be greater and the smaller the CEJ-AP distance then the percentage of alveolar bone loss will decrease.

The results of this study are similar to Amaliya, *et al.* which examined alveolar bone altitude differrences by using the alveolar bone loss percentage formula showed that there was greater alveolar bone loss in smokers than in nonsmokers, where alveolar bone height was less than 82% in smokers categorized as low. In the non-smoker group, there was a lower alveolar bone loss where this group had an average bone height greater than 82%.[13]

The percentage of alveolar bone loss by types of periodontitis between smokers and non-smokers suggests a greater alveolar bone loss in smokers than non-smokers in mild, moderate and severe periodontitis (Table 5). There is a significant difference between chronic mild, moderate, and severe periodontitis of smokers and non-smokers.

The results of this study showed similar results with Velitchka's study, *et al.* about the association of alveolar bone loss with clinical examination (pocket depth and attachment loss) and microbial status in patients with severe chronic periodontitis showed that there was a significant relationship between alveolar bone loss and attachment loss. This is due to the worsening environment of the oral cavity (loss of attachment and deep pockets) provides a place for microbial pathogens to more easily damage the host and it can be compounded by smoking habits.[14]

Based on the study it can be concluded that there is a significant difference of alveolar bone loss of the maxillary incisors and maxillary molars between smokers and non-smoker patient with periodontitis chronic.

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